

REMARKS/ARGUMENTS

Applicant responds herein to the Office Action dated July 9, 2004.

The applicant's undersigned representative appreciates the Examiner's thorough search and further analysis of the present invention.

The applicant has further amended claims 9, 25 and 33 and wishes to point out relative to these claims, that they are characterized by certain features which include:

- (a) A substrate treating apparatus for removing organisms from substrates, comprising:
- (b) support means including a chuck rotatable by a motor for supporting and spinning a substrate in a horizontal plane;
- (c) cleaning solution supply means including a nozzle for supplying a cleaning solution having ozone dissolved in deionized water to an upper surface of the substrate;
- (d) ultraviolet emitting means including UV lamps and a reflector for emitting ultraviolet light to the substrate, the ultraviolet emitting means emitting ultraviolet light under atmospheric conditions to the substrate from an irradiating position above the support means; and
- (e) a controller for rotating the support means supporting the substrate, supplying the cleaning solution from the nozzle of the cleaning solution supply means to a spin center of the substrate supported and spun, and, during this cleaning process, supplying power to the UV lamps to emit ultraviolet light to the cleaning solution supplied to the substrate and forming a puddle on the upper surface of the substrate.

In the aforementioned inventions, oxygen radicals are thus allowed to be generated easily by supplying a cleaning solution having ozone dissolved in deionized water to a substrate supported by the indicated support, and irradiating the cleaning solution with ultraviolet light under atmospheric conditions. The oxygen radicals react with water to generate OH radicals, thereby increasing the activity of the cleaning solution.

A significantly improved cleaning capability is thereby achieved, even with low concentration ozone water. The structure of the invention is applicable and can be utilized either in large scale or even single-substrate reading apparatus for treating small or large substrates. Since the cleaning solution supplied to the substrate contains ozone in a low concentration, a filter and piping materials for supplying the cleaning solution need not have strong ozone resistance.

Turning to the references, Tomita discloses a single-substrate treating apparatus for separating resist in spin cleaning. Tanaka discloses an ultraviolet emitting device including a reflector for reflecting ultraviolet light.

As described above, an important feature of the invention derives from the fact that it emits ultraviolet light to a cleaning solution having ozone dissolved in the ionized water, as in feature (c) described above. Thus, the ultraviolet light is hardly absorbed by the cleaning solution, and generates OH radicals adjacent the substrate surface to be cleaned, thereby cleaning the surface more efficiently.

Also as noted above in feature (d), ultraviolet light is emitted to the substrate under atmospheric conditions. This reduces the absorption of ultraviolet light, and allows the ultraviolet light to be emitted adjacent the substrate surface, thereby assuring an excellent cleaning fact.

The foregoing points are readily discernable from the graph in Figure 8 of the instant application and from the related description. That is, the present invention employs a unique construction that is specially tailored and structured to form on the substrate surface a thin film of the cleaning solution having ozone dissolved in deionized water, and using the characteristic of ultraviolet light that is hardly absorbed by deionized water and air to improve the cleaning effect.

It is respectfully submitted that the foregoing characteristic features of the invention are neither disclosed nor rendered obvious by any reference of record nor by the combination thereof. As such, all of the claims in the application are submitted to be patentable over the prior art.

Accordingly, the Examiner is respectfully requested to reconsider the application, allow the claims as amended and pass this case to issue.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on October 4, 2004

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Respectfully submitted,

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